REMARKS

By this Amendment, claims 1-2 are cancelled, claims 3-6 and 11-12 are amended, and claims 13-18 are added. Claims 7-10 remain in the application. Thus, claims 3-18 are active in the application. Reexamination and reconsideration of the application are respectfully requested.

The specification and abstract have been carefully reviewed and revised in order to correct grammatical and idiomatic errors in order to aid the Examiner in further consideration of the application. The amendments to the specification and abstract are incorporated in the attached substitute specification and abstract. No new matter has been added.

Also attached hereto is a marked-up version of the substitute specification and abstract illustrating the changes made to the original specification and abstract.

In item 2 on page 2 of the Office Action, claims 1 and 11-12 were rejected under 35 U.S.C. § 102(e) as being anticipated by Vialén et al. (U.S. 6,603,310). Further, in item 6 on page 7 of the Office Action, claim 2 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Vialén et al in view of Lundh et al. (U.S. 6,373,384). These rejections are believed to be moot with respect to claims 1-2 in view of the cancellation of these claims.

Further, in item 7 on page 9 of the Office Action, claims 3 and 5 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Vialén et al. in view of Kumaki et al. (U.S. 6,473,411). Lastly, in item 8 on page 15 of the Office Action, claims 4 and 6 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Vialén et al. in view of Lundh et al. and further in view of Kumaki et al.

Without intending to acquiesce to the rejection of claims 3-6 and 11-12, independent claims 3-6 and 11-12 were each amended in order to more clearly illustrate the marked differences between the present invention and the applied references. Accordingly, the Applicant respectfully submits that claims 3-6 and 11-12 are clearly patentable over the applied references for the following reasons.

The present invention provides a subscriber wireless access system which is equipped with customer stations that are wirelessly connected to base stations and for accommodating communication terminal devices in the customer stations. The

subscriber wireless access system of the present invention comprises at least one exchange for connecting the base stations with a virtual dedicated line so as to enable customer stations which are wirelessly connected to different base stations to be interconnected via a virtual dedicated line network.

The at least one exchange includes a table for correlating identification information which is assigned to the customer stations with virtual dedicated line network connection information allocated for connecting the customer stations. The at least one exchange also includes means for receiving data from a customer station via a subordinate base station, and, with reference to the table, sending the received data through the virtual dedicated line network to another base station. Further, the at least one exchange also includes means for receiving data through the virtual dedicated line network, and, with reference to the table, converting the received data to customer station identification information of a customer station and sending the converted data to a subordinate base station.

The present invention also provides that each customer station is assigned station-specific identification information for identifying the individual customer station and group identification information for identifying the individual customer station as a member of a customer station group, and each customer station group is assigned unique group identification information. Further, each base station has a first table for correlating the virtual dedicated line network connection information with the group identification information of each customer station group and a second table for correlating the station-specific identifier information and the group identification information of each customer station group, and the first and second tables of each the base stations contain the same group identification information for customer stations belonging to the same customer station group.

Therefore, according to the subscriber wireless access system of the present invention, when different customer stations under the base stations are formed into closed customer station groups, the communication terminals under each customer station group can be virtually connected to each other as if the communication terminals were connected to each other over a conventional LAN.

For instance, if a company, as a customer station, has offices in Washington, D.C. and in Los Angeles, the communication terminals of each office are not able to connect to each other. However, according to the above-discussed features of the present invention, when the Washington, D.C. and Los Angeles offices are under the same base station, the communication terminals of each office are able to virtually connected to each other as if the communication terminals where connected to each other over a conventional LAN.

Further, according to the present invention, a group of customer stations which are connected through the virtual line network can be easily established with remote operation by an operation center when the subscriber wireless system of the present invention is configured as a simple network management protocol (SNMP) system and the first and second tables of the base stations are configured as management information bases (MIBs).

Claims 3-6 and 10-11 have each been amended to recite this important feature of the present invention. Accordingly, claims 3-6 and 10-11 have each been amended to recite that each customer station is assigned station-specific identification information for identifying the individual customer station and group identification information for identifying the individual customer station as a member of a customer station group, and each customer station group is assigned unique group identification information. Further, claims 3-6 and 10-11 have been amended to recite that each base station has a first table for correlating the virtual dedicated line network connection information with the group identification information of each customer station group and a second table for correlating the station-specific identifier information and the group identification information of each customer station group, and the first and second tables of each the base stations contain the same group identification information for customer stations belonging to the same customer station group.

Vialén et al. discloses a wireless access system for enabling wireless data transmission into existing ATM networks. The system of Vialén et al. includes mobile stations MS, base stations BTS, a base station controller BSC which controls several of the base stations BTS, a mobile telephone exchange MSC and an ATM network which has one or more ATM switches 30. The mobile stations MS communicate through the closest BTS. A mobile network PLMN which is also connected independently to the

ATM network includes other network elements such as a subscriber database (home location register) HLR, a visitor location register VLR and an operation maintenance center OMC. The subscriber database HLR permanently contains subscriber information and information indicating the visitor location register VLR in the area in which a mobile station is located at a particular time. The subscriber information regarding subscribers visiting the VLR is temporarily copied to the VLR (see Column 5, lines 9-31).

Vialén et al. also discloses that the ATM network switch 3 provides a connection between a BTS and the elements of the PLMN network and that the PLMN network can transmit signaling messages, such as call control, mobility management and authentication, between the MSC and the MS (see Column 5, lines 38-39 and Column 6, lines 1-5). Vialén et al. discloses that user-network interface UNI management information is presented in a management information base MIB which is located in the ATM network switch 3. The MIB located in the ATM network switch 3 includes virtual path connections VPC, virtual channel connections VCC and address registration information, which together comprise virtual dedicated line connection information VPI/VCI values for establishing a call-setup between a mobile station MS and one of the elements of the PLMN network through a base station BS (see Column 6, lines 50-58, Column 7, line 12 to Column 8, line 6, and Figures 1-2 and 4).

Accordingly, Vialén et al. merely discloses that the ATM network switch 3, which the Examiner interprets as corresponding to the exchange of the present invention, includes a management information base MIB which holds the VPI/VCI values for establishing a call-setup between a mobile station MS and one or more elements of the PLMN network. Further, as acknowledged by the Examiner, Vialén et al. does not disclose or suggest that each base station has tables for correlating the station-specific identifier information and the group identification information and containing the same group identification information for customer stations belonging to the same customer station group.

Furthermore, Vialén et al. clearly does not disclose or suggest that each base station has a first table for correlating the virtual dedicated line network connection information with the group identification information of each customer station group and a second table for correlating the station-specific identifier information and the group

identification information of each customer station group, and the first and second tables of each the base stations contain the same group identification information for customer stations belonging to the same customer station group, as recited in claims 3-6 and 11-12.

Kumaki et al. discloses a router device which is connected to the Internet for accommodating mobile terminals 201 to communicate with an IP terminal 225 or a mobile communication network 226. Kumaki et al. discloses that radio base stations 202 and 203 have a radio channel VPI/VCI correspondence management table for setting the radio channel and VPI/VCI in correspondence with each other and carrying out VPI/VCI conversion as necessary (see Column 46, lines 57-60). Each of the mobile terminals 201 are freely movable and the mobile terminals 201 detect when they move from one radio base station 202 to another radio base station 203. The moving mobile terminal 201 transmits a handoff request which contains unique identification information of the moving mobile terminal 201 together with base station identification of the visited radio base station 202 or 203 to which the moving mobile terminal 201 has moved. The radio base station 202 or 203 which receives the handoff request from the moving mobile terminal 201 transmits the handoff request to a mobile supporting router MSR 220 or 221 using a pre-assigned radio channel of the visited radio base station 202 or 203, respectively (see Column 47, lines 35-44). The MSR 220 or 221 then determines an IP address of the mobile terminals 201. Then, an updated VPI/VCI value is registered for the originally located mobile station 201, and a VCI/radio CH allocation request is transmitted to the visited radio base station 202 or 203 so as to request the set up of a channel between the moving mobile terminal 201 and the visited radio base station 202 or 203. Then, the corresponding value of the radio CH-VPI/VCI correspondence table is set, and a connection is set up between the MSR and the moving mobile terminal 201 (see Column 49 to Column 48, line 26).

However, the radio base stations 202 and 203 of Kumaki et al. are not disclosed or suggested as having a first table for correlating the virtual dedicated line network connection information with the group identification information of each customer station group and a second table for correlating the station-specific identifier information and the group identification information of each customer station group, where the first and second tables of each the base stations contain the same group identification information

for customer stations belonging to the same customer station group, as recited in claims 3-6 and 11-12.

Lundh et al. discloses a system 20 for synchronizing a cellular telecommunications unit between a master timing unit 60 of a control node 30 of the network and a slave timing unit STU which is located in one of a plurality of base stations 22 of the network A mobile connection is established between a mobile station 24 and a mobile switching center MSC 40 through base stations 22 and a radio network controller RNC 30 (see Column 5, lines 40-62 and Figure 1). Each of the base stations of Lundh et al. include an exchange (see Column 6, lines 34-46 and Figure 1).

However, in contrast to the present invention, the base stations 22 of Lundh et al. are not disclosed or suggested as having a first table for correlating the virtual dedicated line network connection information with the group identification information of each customer station group and a second table for correlating the station-specific identifier information and the group identification information of each customer station group, where the first and second tables of each the base stations contain the same group identification information for customer stations belonging to the same customer station group, as recited in claims 3-6 and 11-12.

Accordingly, Vialén et al., Kumaki et al. and Lundh et al., either individually or in combination, clearly fail to disclose or suggest that that each base station has a first table for correlating the virtual dedicated line network connection information with the group identification information of each customer station group and a second table for correlating the station-specific identifier information and the group identification information of each customer station group, and that the first and second tables of each the base stations contain the same group identification information for customer stations belonging to the same customer station group, as recited in claims 3-6 and 11-12.

Therefore, no obvious combination of Vialén et al., Kumaki et al. and Lundh et al. would result in the inventions of claims 3-6 and 11-12 since Vialén et al., Kumaki et al. and Lundh et al., either individually or in combination, clearly fail to disclose or suggest each and every limitation of claims 3-6 and 11-12. Accordingly, claims 3-6 and 11-12 are neither anticipated nor rendered unpatentable over Vialén et al., Kumaki et al. and Lundh et al. since Vialén et al., Kumaki et al. and Lundh et al., either individually or in

combination, clearly fail to disclose or suggest each and every limitation of claims 3-6 and 11-12.

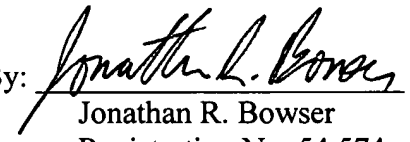
Furthermore, it is submitted that the clear distinctions discussed above are such that a person having ordinary skill in the art at the time the invention was made would not have been motivated to modify Vialén et al., Kumaki et al. and Lundh et al. in such as manner as to result in, or otherwise render obvious, the present invention as recited in claims 3-6 and 11-12. Therefore, it is submitted that the claims 3-6 and 11-12, as well as claims 7-10 and 13-18 which depend therefrom, are clearly allowable over the prior art as applied by the Examiner.

In view of the foregoing amendments and remarks, it is respectfully submitted that the present application is clearly in condition for allowance. An early notice thereof is respectfully solicited.

If, after reviewing this Amendment, the Examiner feels there are any issues remaining which must be resolved before the application can be passed to issue, the Examiner is respectfully requested to contact the undersigned by telephone in order to resolve such issues.

Respectfully submitted,

Naoki YOKOYAMA

By: 

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Version with Markings to Show Changes Made

TITLE OF THE INVENTION

SUBSCRIBER WIRELESS ACCESS SYSTEM

BACKGROUND OF THE INVENTION

Field of the Invention~~:~~

The present ~~This~~ invention relates to a subscriber wireless access system for accommodating, in a customer station which is wirelessly connected to a base station, personal computers and other such communication terminal devices, or a LAN connected to such communication terminal devices. (A subscriber wireless access system of this type is also called, for example, a fixed wireless access (FWA) system.) More particularly, the present invention relates to a technology for controlling communications through a virtual dedicated line network which is implemented by an ATM (asynchronous transfer mode) network or the like.

Description of the Prior Art~~:~~

Personal ~~Recent years have seen personal~~ computers, mobile tools, mobile telephones and various other kinds of communication terminal equipment have recently become common items of everyday use. Wireless LANs for wirelessly interconnecting such communications terminal devices have been developed and put into operation.

Subscriber ~~There have also been developed and implemented subscriber~~ wireless access systems which ~~that~~ accommodate ~~in a~~ customer station communication terminal devices, or a LAN or the like that is connected to communication terminal devices, and which ~~that~~ wirelessly connect the customer station with a base station have been developed and implemented.

The wireless communication capability such a subscriber wireless access system provides between the base station and the customer stations makes it possible to interconnect the communications network on the base station side and the communication terminal devices on the customer station side. Moreover, by ~~By~~ allowing the base station to function as a bridge, ~~moreover,~~ such a system can provide an interconnection among the communication terminal devices of multiple customer stations accommodated by one and the same base station.

The use ~~Use~~ of a subscriber wireless access system therefore makes it possible, by simply setting up a base station and a customer station, to connect communication terminal

devices, or their LANs, to a communications network without the need to install ~~for installing~~ communication lines.

The use ~~Use~~ of a subscriber wireless access system also makes it possible to group a number of customer stations which are served by the same base station. For example, a subscriber's LANs can be divided up and each connected to a different customer station within the same group. A company (subscriber) with several buildings can connect the LANs that are installed in the individual buildings to different customer stations within the same group and thus enjoy such benefits as companywide LAN integration.

The rising importance of and need for telecommunications are producing a strong demand for the constant interconnection between communication terminal devices. The demand ~~Demand~~ for a constant connection is also strong from users of subscriber wireless systems, who are seeking to use an ATM network and other virtual dedicated line network services which are offered by communications companies so as to maintain a constant connection among the communication terminal devices under their customer stations.

The subscriber wireless access system, which uses a virtual dedicated line network so as to interconnect different base stations, enables the communication terminal devices which are served by the different customer stations wirelessly connected to these different base stations to maintain a constant connection via the virtual dedicated line network.

In the subscriber wireless access system, however, since the base stations accommodate multiple customer stations belonging to different entities, the mere connection of base stations by a virtual dedicated line network results in a constant connection between customer stations that should not be constantly connected (i.e., between their communication terminal devices).

Consider, for example, the case where company A's head office in Tokyo has a customer station which is served by a base station in Tokyo and its branch office in Osaka has a customer station which is served by a base station in Osaka. If the LAN of the Tokyo head office customer station and the LAN of the Osaka branch office customer station are constantly connected, the LAN of company B's customer station, which is accommodated by the same base station as company A's Tokyo head office customer station, will also be constantly connected with company A's Osaka branch office. This is undesirable from a ~~the point of~~ secrecy protection stand point.

The present ~~This~~ invention was accomplished in light of these circumstances and has as an object to provide a subscriber wireless access system which ~~that~~ enables a trouble-free constant connection through a virtual dedicated line network.

Other objects of the present invention will become more apparent from the following description.

SUMMARY OF THE INVENTION

The present invention provides a subscriber wireless access system which is equipped with customer stations that are wirelessly connected to base stations and accommodating communication terminal devices in the customer stations directly or through a network such as a LAN. The subscriber wireless access system according to the present invention comprises: at least one exchange for connecting base stations with a virtual dedicated line network for enabling customer stations which are wirelessly connected to different base stations to be interconnected via a virtual dedicated line network, where the at least one exchange includes ~~including~~ a table correlating identification information that is assigned to the customer stations with virtual dedicated line network connection information allocated for connecting the customer stations; means responsive to the receipt of data from a customer station via a subordinate base station for, with reference to the table, sending the data through the virtual dedicated line network to another base station; and means responsive to the receipt of data through the virtual dedicated line network for, with reference to the table, converting the data to customer station identification information of a customer station and sending the data to a subordinate base station.

For example, in a specific configuration, the exchange stores in the table station-specific IDs (CPE-IDs: consumer premises equipment identifiers) which are assigned to the individual customer stations or tags (VLAN-Tags: virtual local area network tags) for customer station identification which are set in Ethernet frames in conformity with IEEE 802.1Q in association with virtual dedicated line network connection information (VPI/VCI: virtual path identifier/virtual channel identifier), responds to the receipt of data form a customer station via a subordinate base station by, with reference to the table, converting identification information of the sending customer station that is attached to the data (CPE-ID or VLAN-Tag) to virtual dedicated line network connection information (VPI/VCI) and sending the data to another base station through the virtual dedicated line network, and responds to the receipt of data through the virtual dedicated line network by, with reference to

the table, converting the virtual dedicated line network connection information (VPI/VCI) of the data to customer station identification information (CPE-ID or VLAN-Tag) and sending the converted data to a subordinate base station (i.e., a customer station).

A constant ~~Constant~~ connection between customer stations (namely, their subordinate communication terminal devices) can therefore be realized. Moreover, since ~~Since~~ the subscriber wireless access system can establish a constant connection between specific subscribers, the ~~moreover, it makes possible services like~~ distribution of information from a pay TV station to subscribers and other similar services is made possible.

In the subscriber wireless access system according to the present invention, an exchange is preferably connected to each of the ~~every~~ base stations ~~station~~ or incorporated in each of the ~~every~~ base stations ~~station~~ so as to control the communications between the base station and the virtual dedicated line network. Preferably, the tables of the exchanges store identical virtual dedicated line network connection information (VPI/VCI) for customer stations which are connected through the virtual dedicated line network.

For instance, the connection information which is associated with the identification information of customer station A stored in one exchange table and the connection information which is associated with the identification information of a customer station B stored in another exchange connected to the same virtual dedicated line network are identical. Thus, for example, the customer station of a company's Tokyo head office and the customer station of the same company's Osaka branch office can maintain a constant connection in a closed environment, and as a result, ~~whereby~~ the communication terminal devices which are served by the two customer stations can stay in constant connection while maintaining communication privacy.

In the subscriber wireless access system of the present invention, each customer station is preferably assigned station-specific identification information for identifying the individual customer station and group identification information for identifying the custom station ~~it~~ as a member of a customer station group. Further, ~~and~~ each base station has tables correlating the station-specific identifier information and the group identification information and stores the same group identification information (VLAN-Tag) for customer stations belonging to the same group.

For example, in a specific configuration, the station-specific identifier information of each customer station is a CPE-ID and the group identification information is a VLAN-Tag, the base stations correlate and manage the CPE-IDs and the VLAN-Tags by using the tables, and

the same VLAN-Tag is stored for customer stations belonging to the same group. For instance, in a case where five customer stations whose CPE-IDs are A to E are installed under a certain base station and the two customer stations whose CPE-IDs are B and D are to be grouped, these two customer stations ~~they~~ are managed by assigning them the same VLAN-Tag in the table.

Therefore, since the group identification information (VLAN-Tags) of the base stations and the customer stations are included in the wireless frames and since the base stations conduct communications control by using the VLAN-Tags, different customer stations under the base stations can be formed into closed groups, and the communication terminal devices under each group of customer stations can be virtually connected as if connected to the same LAN.

Further, if the VLAN-Tags constituting the identification information of the customer stations are managed by associating them with the virtual dedicated line network connection information (VPI/VCI) which is also in the exchange table, customer station groups under different base stations can also be constantly connected through the virtual dedicated line network.

The subscriber wireless access system can be configured as a simple network management protocol (SNMP) system, the tables of the base stations can be configured as management information bases (MIBs), and the group identification information (VLAN-Tags) can be written to the management information bases by using information that is sent from a management unit (SNMP manager) which is connected via the virtual dedicated line network.

This makes it possible, for example, for an administration (operation) center that has received a subscriber request for the ~~group~~ formation of a group to establish the desired group by remote operations with respect to the base stations. Groups of customer stations which are constantly connected through the virtual dedicated line network can therefore be easily established without the need for workers to visit and conduct an on-site setup at the individual base stations.

In the subscriber wireless access system according to the present invention, the group identification information (VLAN-Tags) which are assigned to the customer stations are preferably included in the wireless frames of the base stations and the customer stations and, therefore, as explained above ~~in the foregoing~~, the communication terminal devices under multiple customer stations can be virtually connected as if connected to the same LAN. In ~~and,~~

~~in~~ addition, the subordinate customer stations can be notified of the group identification information (VLAN-Tags) that is written in the base station tables.

The present invention also provides an exchange for connecting base stations to a virtual dedicated line network so as to enable customer stations which are wirelessly connected with different base stations to be interconnected via the virtual dedicated line network. This ~~the~~ exchange according to the present invention comprises~~comprising~~: a table correlating identification information which is assigned to the customer stations (VLAN-tags, CPE-IDs or the like) with virtual dedicated line network connection information that is allocated for connecting the customer stations (VPI/VCI or the like); means for, with reference to the table, sending data that is received from a customer station via a subordinate base station through the virtual dedicated line network to another base station; and means for, with reference to the table, converting data that is received through the virtual dedicated line network to customer station identification information and sending the converted data to a subordinate base station.

The present invention also provides a base station which is capable of connecting to a virtual dedicated line network for enabling customer stations which are wirelessly connected with different base stations to be interconnected via the virtual dedicated line network. The ~~the~~ base station according to the present invention comprises~~comprising~~: a table correlating identification information which is assigned to the customer stations (VLAN-tags, CPE-IDs or the like) with virtual dedicated line network connection information that is allocated for connecting the customer stations (VPI/VCI or the like); means for, with reference to the table, sending data that is received from a customer station via a subordinate base station through the virtual dedicated line network to another base station; and means for, with reference to the table, converting data that is received through the virtual dedicated line network to customer station identification information and sending the converted data to a subordinate base station.

BRIEF EXPLANATION OF THE DRAWINGS

FIG. 1 is a block diagram of a subscriber wireless access system according to ~~that is~~ an embodiment of the present invention.

FIG. 2 is a conceptual diagram for explaining the contents of tables of a subscriber wireless access system according to ~~that is~~ an embodiment of the present invention.

FIG. 3 is a conceptual diagram for explaining an Ethernet frame according to ~~in~~ an embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION ~~PREFERRED EMBODIMENT~~

The present invention will now be ~~explicitly~~ explained in detail with respect to the case where the communication protocol between the base station and the customer stations utilizes Ethernet frames tagged with VLAN-Tags conforming with IEEE 802.1Q.

FIG. 1 is a block diagram of the subscriber wireless access system according to the present embodiment. FIG. 2 is a diagram showing the contents of correlation tables of the exchanges and base stations.

As shown in FIG. 1, multiple base stations are connected by SNMP via an ATM trunk network N, which is a virtual dedicated line network. Each base station accommodates a number of customer stations which are wirelessly connected by Ethernet frames. Each customer station is connected through a router R with a local area network L accommodating a large number of communication terminal devices (PCs; not shown).

The ATM trunk network N is connected with various servers of Internet service providers (ISP-A, ISP-B) and the like. The ATM trunk network N ~~It~~ is also connected with a SNMP manager server M which is installed at an operation center that manages the subscriber wireless access system according to the present invention.

In the ensuing explanation, the two base stations are designated base station #1 and base station #2, the four customer stations which are accommodated by the base station #1 are designated CPE#1 – CPE#4, and the four customer stations which are accommodated by the base station #2 are designated CPE#5 – CPE#8.

In this embodiment, an exchange is incorporated in the ATM trunk network interface unit of each base station. The exchange section of each base station, which mainly handles communications control of the virtual dedicated line network, is designated ATM-SW, and the base station section of each base station, which mainly handles wireless communications control of the customer stations, is designated BSE.

In each of the base station #1 and the base station #2, the ATM-SW is provided with a MIB table T1, and the BSE is provided with a MIB table T2. The contents of the MIB tables can be defined by the SNMP ~~SNP~~ server through the ATM trunk network N.

In this embodiment, the MIB tables T1 and T2 are defined to store contents like those shown in FIG. 2.

In the table T2 which is provided in the BSE of the base station #1, the station-specific identifier CPE-IDs of the of the subordinate CPEs #1 – #4 are entered in association with the group identifiers VLA-Tag of the same CPEs. VLAN-Tag: 1 is associated with CPE#1

assigned CPE-ID: 1, VLAN-Tag: 2 is associated with CPE#2 assigned CPE: 2, and VLAN-Tag: 3 is associated with both CPE#3 assigned CPE: 3 and CPE#4 assigned CPE: 4. In other words, the CPE#3 and CPE#4 are defined as belonging to the same group.

In the table T2 which is provided in the BSE of base station #2, the station-specific identifier CPE-IDs of the subordinate CPEs #5 – #8 are written in association with the group identifiers VLA-Tag of the same CPEs. VLAN-Tag: 1 is associated with CPE#5 assigned CPE-ID: 5, VLAN-Tag: 2 is associated with both CPE#6 assigned CPE: 6 and CPE#7 assigned CPE: 7, and VLAN-Tag: 3 is associated with CPE#8 assigned CPE: 8. In other words, the CPE#6 and CPE#7 are defined as belonging to the same group.

In the embodiment shown in FIG. 1, the CPE#3 and CPE#4 are two customer stations at user A's Tokyo head office, and the CPE#6 and CPE#7 are customer stations of the same user A's Nagoya branch office. This embodiment conducts communications control between user A's Tokyo and Nagoya customer stations, and conducts communications control with the Tokyo and Nagoya customer stations, which are kept in constant connection.

The BSEs of the base stations #1 and #2 are provided with communications control capability for controlling wireless communications with the customer stations using the Ethernet frame shown in FIG. 3. The BSEs ~~They~~ conduct communications control by using the MAC address which is included in the frame as the address of a specific communication terminal device, control communications within customer station groups according to the VLAN-Tag that is included in the frame, and control the handling of transmission data that is included in the IP frame.

The ATM-SW and BSE of the base station #1 are connected by VLAN-Tag logical channels. In the table T1 provided in the ATM-SW of the base station #1, the VLAN-Tags are entered in association with information VPI/VCI specifying a connection with a path of the ATM trunk network N. For example, VPI/VCI: 2/1 is associated with VLAN-Tag: 3. In other words, communication by VLAN-Tag: 3 is conducted in a constantly connected state through the connection which is specified by VPI/VCI: 2/1 of the ATM trunk network N.

The ATM-SW and BSE of the base station #2 are connected by VLAN-Tag logical channels. In the table T1 provided in the ATM-SW of the base station #2, the VLAN-Tags are entered in association with information VPI/VCI specifying a connection with a path of the ATM trunk network N. For example, VPI/VCI: 2/1 is associated with VLAN-Tag: 2. In other words, communication by VLAN-Tag: 2 is conducted in a constantly connected state through the connection which is specified by VPI/VCI: 2/1 of the ATM trunk network N.

The ATM-SW of each of the base stations #1 and #2 is provided with conversion/control capability for using the contents of its table T1 to convert VPI/VCI to VLAN-Tag and thereby pass data that is received from the ATM trunk network N through the VLAN logical channels to the BSE, and also to use the content of its table T1 to convert VLAN-Tag to VPI/VCI and thereby send the data that is received from the BSE through the VLAN logical channel out on the ATM trunk network N.

Owing to the conversion/control capability of ATM-SW, therefore, the group on the base station #1side including CPE#3 and CPE#4 assigned VLAN-Tag: 3 and the group on the base station #2 side including CPE#6 and CPE#7 assigned VLAN-Tag: 2 are constantly connected though the connection of the ATM trunk network N which is specified by VPI/VCI: 2/1. The customer stations installed at user A's Tokyo head office (i.e., the communication terminal devices under them) and the customer stations installed at user ~~uer~~ A's Nagoya branch office (i.e., the communication terminal devices under them) are constantly connected.

In the subscriber wireless access system of the foregoing configuration, if, for example, a subscriber (user A) wants to group the CPE#6 and CPE#7 and sends a request to this effect to the operating center, the operating center SNMP manager M rewrites the MIB Table 2 that is provided in the BSE of the base station #2 in line with the sent request. Specifically, the SNMP manager server M connects with the base station #2 through an ATM trunk network N setting connection VPI/VCI: 1/1, uses a setting VLAN-Tag: 500 to access the BSE of the base station #2, and sets the same VLAN-Tag: 2 for the CPE#6 and CPE#7 in the MIB table 2.

Since, as shown in FIG. 3, the wireless frames of the BSE and CPE include VLAN-Tags, the CPE is notified of the VLAN-Tag that is set in the MIB table 2 of the BSE in this way by wireless communication between the BSE and the CPE.

If, for example, a subscriber (user A) wants to establish a constant connection between the group which is composed of the CPE#3 and CPE#4 of the base station #1, which have already been grouped by setting the same VLAN-Tag: 3, and a customer station group which is composed of the CPE#6 and CPE#7 of the base station #2, and sends a request to this effect to the operating center, the operating center SNMP manager server M rewrites the MIB table 1 that is provided in the ATM-SW of the base station #1 in line with the sent request.

Specifically, the SNMP manager server M connects with the base station #1 via the setting connection VPI/VCI: 1/1 of the ATM trunk network N, accesses ATM-SW, and, in the

MIB table T1, sets in association with VLA-Tag: 3 of the CPE#3 and CPE#4 of the base station #1 the same VPI/VCI: 2/1 as set for the CPE#6 and CPE#7 of the base station #2.

The present invention thus enables the setting of CPE groups and the establishment of a constant connection between CPEs through the ATM trunk network N by a remote operation from the SNMP manager server M.

When the foregoing table setting is in effect and data are, for instance, transmitted from a communication terminal device under the CPE#3 to a communication terminal device under the CPE#4, the VLAN-Tag that is included in the transmission frame which is sent from the CPE#3 to the BSE of the base station #1 transfers the data to the CPE#4 which is associated with the same VLAN-Tag.

Even under the same base station, therefore, communication terminal devices that are accommodated under different customer stations (CPEs) can communicate with each other just as if they were connected by the same LAN.

When data is ~~are~~ sent from a communication terminal device under the CPE#3 to a communication terminal device under a CPE of the same user that is accommodated by another base station (base station #2), the data is ~~are~~ handed over to the ATM-SW in the base station #1 and, based on the MIB table T1, is ~~are~~ sent to the base station #2 through the constant VPI/VCI: 2/1 connection which is established in the ATM trunk network N. The base station #2, based on the VPI/VCI: 2 and its own MIB table 1, converts the received data to the associated VLAN-Tag: 2 and sends the converted data ~~them~~ to the CPE#6 and CPE#7 which are accommodated by the base station #2.

Customer stations (communication terminal devices) which are accommodated by different base stations can therefore be constantly connected based on settings.

As explained above~~in the foregoing~~, the present invention provides a subscriber wireless access system that enables a trouble-free constant connection between customer stations which are accommodated by different base stations through a virtual dedicated line network without difficulty ~~trouble~~ and enables the simple formation of customer station groups. In addition, the present invention enables the operations for making and modifying the settings for establishing such constant connections and customer station groups to be centralized and performed remotely.

ABSTRACT

A subscriber wireless access system equipped with customer stations wirelessly connected to base stations and accommodating communication terminal devices in the customer stations. The system is provided with ~~which has~~ at least one exchange for connecting the base stations with a virtual dedicated line network for enabling customer stations wirelessly connected to different base stations to be interconnected via a virtual dedicated line network. The exchange includes ~~a~~ table ~~correlating identification~~ information assigned to the customer stations with virtual ~~dedicated line~~ network connection information allocated for connecting the customer stations, ~~;~~ means responsive to receipt of data from a customer station via a subordinate base station for, with reference to the table, sending the data through the virtual ~~dedicated line~~ network to another base station, ~~;~~ and means responsive to receipt of data through the virtual ~~dedicated line~~ network for, with reference to the table, converting the data to customer station identification information ~~of a customer station~~ and sending the data to a subordinate base station.